What is claimed is:

1. A system for providing a desired stiffness using an electroactive polymer transducer, the system comprising:

a device comprising

a mechanical interface capable of displacement,

a transducer comprising at least two electrodes, and an electroactive polymer in electrical communication with the at least two electrodes and coupled to the mechanical interface, the polymer arranged in a manner that allows deflection of the polymer corresponding to displacement of the mechanical interface; and

control electronics in electrical communication with the at least two electrodes and designed or configured to set or change the electrical state of the transducer in order to cause a corresponding setting or change in the stiffness of the device.

2. The system of claim 1 wherein the control electronics comprise a voltage source in electrical communication with the at least two electrodes.

3. The system of claim 2 wherein the control electronics are configured to vary the voltage provided to the at least two electrodes.

4. The system of claim 2 wherein the voltage source is a high voltage source that supplies a voltage greater than 200 Volts.

5. The system of claim 1 wherein the device is configured such that displacement of the mechanical interface increases electrical energy within one of the transducer and the control electronics.

6. The system of claim 1 wherein the control electronics comprise a logic device configured to set or change the electrical state.

7. The system of claim 1 wherein the control electronics comprise an open loop control designed or configured to set or change the electrical state.

8. The system of claim 7 wherein the control electronics comprise a buffer capacitor.

9. The system of claim 8 wherein the buffer capacitor has a larger capacitance than the capacitance of the transducer for zero deflection of the transducer.

10. The system of claim 7 wherein the open loop control allows substantially free flow of charge to and from the transducer.

11. The system of claim 7 wherein the control electronics are configured to set or change a substantially constant charge that is provided to the at least two electrodes.

12. The system of claim 7 wherein the control electronics are configured to set or change a substantially constant voltage that is provided to the at least two electrodes.

13. The system of claim 7 wherein the open loop control comprises one of a transistor, triac, or relay.

14. The system of claim 1 wherein the system is further designed or configured to provide one of actuation, generation, and sensing.

15. The system of claim 14 wherein the device is designed or configured such that a first active area of the transducer provides the desired stiffness of the device and a second active area of the transducer provides the one of actuation, generation, and sensing.

16. The system of claim 1 wherein the system is further configured to provide damping, the system comprising:

dissipative electronics in electrical communication with the at least two electrodes and designed or configured to dump electrical energy in response to a change in the electrical state.

17. The system of claim 16 wherein the dissipative electronics comprise a resistor.

18. The system of claim 17 wherein the resistor has a resistance that produces an RC time constant for the resistor and the transducer in the range of about 0.1 to about 4 times the period of a frequency of interest.

19. The system of claim 17 wherein the resistor has a resistance that produces an RC time constant for the resistor and the transducer in the range of about 2 to about 100 times the period of a frequency of interest.

20. The system of claim 19 wherein the resistor has a resistance that produces an RC time constant for the resistor and the transducer in the range of about 5 to about 30 times a frequency of interest.

21. The system of claim 17 wherein the control electronics are designed or configured to provide stiffness control of the device independent from damping control.

22. The system of claim 21 wherein the resistor is a variable resistor.

23. The system of claim 1 wherein the device stiffness changes with polymer deflection.

24. The system of claim 23 wherein the device stiffness changes as a result of a shape change in the polymer related to the polymer deflection.

25. The system of claim 23 wherein the device stiffness changes as a result of a structural change in the device related to the polymer deflection.

26. The system of claim 1 wherein the control electronics are further configured or designed to apply an electrical state that places the polymer in a stiffness regime that provides a desired stiffness for the device.

27. The system of claim 1 wherein the electroactive polymer is a dielectric elastomer.

28. A system for providing damping using an electroactive polymer transducer, the system comprising:

a device comprising

a mechanical interface capable of displacement,

a transducer comprising at least two electrodes, and an electroactive polymer in electrical communication with the at least two electrodes and coupled to the mechanical interface, the polymer arranged in a manner that allows deflection of the polymer corresponding to displacement of the mechanical interface; and

control electronics in electrical communication with the at least two electrodes and designed or configured to set or change an electrical state of the transducer; and

dissipative electronics in electrical communication with the at least two electrodes and designed or configured to dump electrical energy in response to a change in the electrical state.

29. The system of claim 28 wherein the dissipative electronics comprise a resistor.

30. The system of claim 29 wherein the resistor has a resistance that produces an RC time constant for the resistor and the transducer in the range of about 0.1 to about 4 times a frequency of interest.

31. The system of claim 29 wherein the dissipative electronics store the electrical energy produced in response to a change in the electrical state .

32. The system of claim 28 wherein the dissipative electronics dump electrical energy in response to displacement of the mechanical interface.

33. The system of claim 28 wherein the control electronics are designed or configured to provide stiffness control of the device independent from damping control.

34. The system of claim 33 wherein the control electronics comprise a variable resistor.

35. The system of claim 28 wherein the control electronics are designed or configured to set or change the electrical state of the transducer in order to cause a corresponding setting or change in the stiffness of the device.

36. The system of claim 28 wherein the control electronics comprise a voltage source in electrical communication with the at least two electrodes and the control electronics are configured to apply a voltage to the at least two electrodes.

37. The system of claim 35 wherein the control electronics comprise an open loop control designed or configured to set or change the electrical state.

38. The system of claim 37 wherein the control electronics comprise a buffer capacitor.

39. The system of claim 38 wherein the buffer capacitor has a larger capacitance than the capacitance of the transducer for zero deflection of the transducer.

40. The system of claim 37 wherein the control electronics are configured to set or change a substantially constant charge that is provided to the at least two electrodes.

41. The system of claim 37 wherein the dissipative electronics dump electrical energy during elastic return of the polymer from a stretched position.

42. A system for providing a desired stiffness using an electroactive polymer transducer, the system comprising:

a device comprising

a mechanical interface capable of displacement,

a transducer comprising at least two electrodes, and an electroactive polymer in electrical communication with the at least two electrodes and coupled to the mechanical interface, the polymer arranged in a manner that allows deflection of the polymer corresponding to displacement of the mechanical interface; and

open loop control electronics in electrical communication with the at least two electrodes and designed or configured to set or change the electrical state of the transducer in order to cause a corresponding setting or change in the stiffness of the device.

43. The system of claim 42 wherein the control electronics are configured to set or change a substantially constant charge that is provided to the at least two electrodes.

44. The system of claim 42 wherein the control electronics comprise a voltage source in electrical communication with the at least two electrodes.

45. The system of claim 44 wherein the control electronics are configured to vary the voltage provided to the at least two electrodes.

46. The system of claim 44 wherein the voltage source is a high voltage source that supplies a voltage greater than 200 Volts.

47. The system of claim 42 wherein displacement of the mechanical interface increases electrical energy within one of the transducer and the control electronics.

48. The system of claim 42 wherein the control electronics comprise a buffer capacitor.

49. The system of claim 48 wherein the buffer capacitor has a larger capacitance than the capacitance of the transducer for zero deflection of the transducer.

50. The system of claim 48 wherein the open loop control allows current to freely flow to and from the transducer.

51. The system of claim 42 wherein the system is further designed or configured to provide one of actuation, generation, and sensing.

52. The system of claim 42 wherein the control electronics are configured to set or change a substantially constant voltage that is provided to the at least two electrodes.

53. The system of claim 42 wherein the open loop control comprises a transistor, triac, or relay.

54. The system of claim 1 wherein the system is configured to influence the resonant frequency of a mechanical system.

55. A system for providing a desired stiffness using an electroactive polymer transducer, the system comprising:

a device comprising

a mechanical interface capable of displacement,

a transducer comprising at least two electrodes, and an electroactive polymer in electrical communication with the at least two electrodes and coupled to the mechanical interface, the polymer arranged in a manner that allows deflection of the polymer corresponding to displacement of the mechanical interface;

control electronics in electrical communication with the at least two electrodes and designed or configured to set or change the electrical state of the transducer in order to cause a corresponding setting or change in the stiffness of the device; and

a sensor configured to detect a parameter related to the desired stiffness and provide feedback to the control electronics.

56. The system of claim 55 wherein the parameter is displacement of the mechanical interface.

57. The system of claim 55 wherein the control electronics comprise a voltage source in electrical communication with the at least two electrodes.

58. The system of claim 57 wherein the control electronics are configured to vary the voltage provided to the at least two electrodes.

59. The system of claim 57 wherein the voltage source is a high voltage source that supplies a voltage greater than 200 Volts.

60. The system of claim 55 wherein the control electronics further comprise a logic device configured to set or change the electrical state.

61. The system of claim 55 wherein the control electronics are configured to set or change the charge provided to the at least two electrodes.

62. The system of claim 55 wherein the mechanical interface is configured to transfer mechanical energy between the polymer and a fluid source.

63. The system of claim 55 wherein the system is further designed or configured to provide damping, the system comprising:

dissipative electronics in electrical communication with the at least two electrodes and designed or configured to dump electrical energy in response to a change in the electrical state.

64. The system of claim 63 wherein the dissipative electronics comprise a resistor.

65. The system of claim 64 wherein the resistor is a variable resistor.

66. The system of claim 65 wherein the control electronics are designed or configured to provide stiffness control of the device independent from damping control.

67. A system for providing a desired stiffness using an electroactive polymer transducer, the system comprising:

a device comprising

a transducer comprising at least two electrodes, and an electroactive polymer in electrical communication with the at least two electrodes; and

control electronics in electrical communication with the at least two electrodes and designed or configured to set or change an electrical state that results in a desired deflection

for the polymer, the desired deflection corresponding to a structural state of the device that results in the desired stiffness for the device.

68. The system of claim 67 wherein the desired deflection for the polymer corresponds to a polymer shape that results in the desired stiffness of the device.

69. The system of claim 67 wherein the polymer shape comprises a bent portion.

70. The system of claim 67 wherein the electroactive polymer is a dielectric elastomer.

71. The system of claim 70 wherein the device comprises two rigid members whose position relative to each other changes with polymer deflection.

72. The system of claim 67 wherein the desired deflection results from actuation using the electrodes.

73. The system of claim 67 wherein the control electronics comprise a high voltage source in electrical communication with the at least two electrodes that supplies a voltage greater than 200 Volts.

74. A system for providing damping using an electroactive polymer transducer, the system comprising:

a device comprising

a mechanical interface capable of displacement,

a transducer comprising at least two electrodes, and an electroactive polymer in electrical communication with the at least two electrodes and coupled to the mechanical interface, the polymer arranged in a manner that allows deflection of the polymer corresponding to displacement of the mechanical interface;

an open loop control source in electrical communication with the at least two electrodes and designed or configured to set or change an electrical state that results in a desired damping for the device; and

dissipative electronics in electrical communication with the at least two electrodes and designed or configured to dump electrical energy in response to a change in the electrical state.

75. The system of claim 74 wherein the open loop control is further designed or configured to set or change an electrical state that results in a desired stiffness for the device.

76. The system of claim 74 wherein the dissipative electronics comprise a resistor.

77. The system of claim 76 wherein the resistor has a resistance that produces an RC time constant for the resistor and the transducer in the range of about 0.1 to about 4 times a frequency of interest.

78. A system for providing damping using an electroactive polymer transducer, the system comprising:

a device comprising

a mechanical interface capable of displacement,

a transducer comprising at least two electrodes, and an electroactive polymer in electrical communication with the at least two electrodes and coupled to the mechanical interface, the polymer arranged in a manner that allows deflection of the polymer corresponding to displacement of the mechanical interface;

dissipative electronics in electrical communication with the at least two electrodes and designed or configured to dump electrical energy in response to a change in the electrical state;

control electronics in electrical communication with the at least two electrodes and designed or configured to set or change an electrical state that results in a desired damping for the device; and

a sensor configured to detect a parameter related to the desired damping and provide feedback to the control electronics.

79. The system of claim 78 wherein the control electronics are further designed or configured to set or change an electrical state that results in a desired stiffness for the device.

80. The system of claim 78 wherein the control electronics further comprise a logic device configured to set or change the electrical state.

81. The system of claim 80 wherein the dissipative electronics comprise a resistor.

82. The system of claim 81 wherein the resistor is a variable resistor controlled by the logic device.

83. A method for providing a desired stiffness using an electroactive polymer transducer, the transducer comprising at least two electrodes and an electroactive polymer in electrical communication with the at least two electrodes, the method comprising applying a substantially constant voltage to the at least two electrodes using control electronics in electrical communication with the at least two electrodes.

84. The method of claim 83 wherein the substantially constant voltage is applied by a buffer capacitor and an open loop control in electrical communication with the at least two electrodes.

85. A method for providing a desired stiffness using an electroactive polymer transducer, the transducer comprising at least two electrodes and an electroactive polymer in electrical communication with the at least two electrodes, the method comprising applying a substantially constant charge to the transducer using control electronics in electrical communication with the at least two electrodes.

86. A method for providing a desired stiffness using an electroactive polymer transducer, the transducer comprising at least two electrodes and an electroactive polymer in electrical communication with the at least two electrodes, the method comprising applying an electrical state to the transducer, using control electronics in electrical communication with the at least two electrodes, that that places the polymer in a stiffness regime that provides the desired stiffness.

87. The method of claim 86 wherein the stiffness regime corresponds to a non-linear stiffness response of the polymer

88. The method of claim 86 further comprising actuating the polymer to achieve the desired stiffness.

89. A system for providing a desired stiffness for a portion of footwear, the system comprising:

footwear designed or configured for human usage, the footwear comprising

a portion of the footwear capable of displacement,

a transducer comprising at least two electrodes, and an electroactive polymer in electrical communication with the at least two electrodes and coupled to the portion, the polymer arranged in a manner that allows deflection of the polymer corresponding to displacement of the portion; and

control electronics in electrical communication with the at least two electrodes and designed or configured to set or change the electrical state of the transducer in order to cause a corresponding setting or change in the stiffness of the footwear.

90. The system of claim 89 wherein the portion comprises a heel portion of the footwear.

91. The system of claim 89 wherein the stiffness is increased for locomotion of a person.

92. The system of claim 89 wherein the control electronics are configured to provide a stiffness within a certain range corresponding to a predetermined level of comfort.

93. A method for resisting motion of a mechanical interface included in a device, the device including an electroactive polymer transducer comprising at least two electrodes an electroactive polymer in electrical communication with the at least two electrodes and coupled to the mechanical interface, the method comprising: a) actuating the polymer out of phase from motion of the mechanical interface that causes the polymer to contract, and b) absorbing electrical energy in generator mode out of phase from motion of the mechanical interface that causes the polymer to expand.

94. The method of claim 93 wherein the motion of the mechanical interface is a vibratory motion.

95. The method of claim 93 further comprising dumping the electrical energy generated in generator mode.